WISMO

Wireless **S**tandard **Mo**dule

WM2C-G900/G1800
EGSM/DCS DUAL BAND Module
Specifications (driven by AT commands)

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PRELIMINARY

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Date : 21/01/00

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1. Introduction

1.1. Scope

This document defines and specifies the second generation EGSM/DCS dual band module called WISMO2C and referenced WM2C-G900/G1800.

1.2. Reference documents

GSM ETSI recommendations for Phase I and Phase II.

Specification Reference	Title
GSM ph2 Radio	ETSI GSM 05.05 and GT 01 v4.2.1
DCS ph2 Radio	ETSI GSM05.05 and GT01 v4.2.1
GSM ph2 Link-Management	ETSI GSM 03.06, 04.08, 05.05, 05.08, 05.10, 07.01 and GT 01 v4.2.1
GSM ph2 Link-Management	ETSI GSM 03.06, 04.08, 05.05, 05.08, 05.10, 07.01 and GT 01 v4.2.1
GSM ph2 Layer 2	ETSI GSM 04.06 and GT 01 v4.2.1
GSM ph2 Layer 3	ETSI GSM 04.08 and GT 01 v4.2.1
DCS ph2 Layer 3	ETSI GSM 04.08 and GT 01 v4.2.1
GSM/DCS Multiband	ETSI GSM 02.07, 03.22, 04.08, 04.13, 05.05, 05.08 and GT 01 v4.2.1
GSM ph2 SIM	ETSI GSM 11.11 and GT 01 v4.2.1
GSM ph2 Teleservices	ETSI GSM 03.50 and GT 01 v4.2.1
GSM ph2 Miscellaneous	ETSI GSM 02.07, 03.40, 03.41, 04.08, 04.10, 04.11, 06.10, 06.11, 06.12, 06.31, 06.32, 07.01, 09.07 and GT 01 v4.2.1
DCS ph2 Miscellaneous	ETSI GSM 02.07, 03.40, 03.41, 04.08, 04.10, 04.11, 06.10, 06.11, 06.12, 06.31, 06.32, 07.01, 09.07 and GT 01 v4.2.1

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2. Functionalities

2.1. General Information

WISMO2C is a self-contained EGSM/DCS dual band module including the following features :

- 58.3 x 32.2 x 6,0 mm external dimensions
- 2 Watts EGSM radio section running under 3,6 Volts
- 1 Watt DCS radio section running under 3,6 Volts
- Digital section under 2.8 Volts
- 3V SIM interface
- Real Time Clock with calendar
- Battery charger
- Echo Cancellation
- Full GSM software stack
- Complete shielding
- Complete interfacing (LCD, keyboard, audio...)

The WISMO2C module has two external connections :

- RF Connector (to the antenna)
- General Purpose Connector (GPC) to Digital, Keyboard, Audio and Supply

WISMO2C is designed to fit in a very small handset and only some custom functions have to be added to make a complete Dual Band handset :

- Keypad and LCD module
- Earpiece and Microphone
- Base connector
- Battery
- Antenna switch
- Sim connector

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2.2. RF Functionalities

The RF functionalities comply with the Phase II GSM900/DCS1800 recommendation. The frequencies are :

- Rx (EGSM) : 925 to 960 MHz
- Tx (EGSM) : 880 to 915 MHz

- Rx (DCS) : 1805 to 1880 MHz
- Tx (DCS) : 1710 to 1785 MHz

The WISMO2C does not support RF swith for a car kit connection, thus it has to be put on the mother board on which the module is set.

The RF part is based on a specific dual band chip including :

◊ 2 dedicated down-converters.

◊ 1 FI demodulator

◊ 1 VCO

◊ Transmit loop (modulator, down mixer, phase frequency comparator)

The RF concept is designed to reduce cost and overall size supporting the removal of the duplexer (for each bandwidth).

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2.3. Baseband functionalities

The digital part of the WISMO2C is composed of a VLSI chip (ONE C GSM Kernel). This chipset is using a 0,35 µm mixed technology CMOS, which allows massive integration as well as low current consumption.

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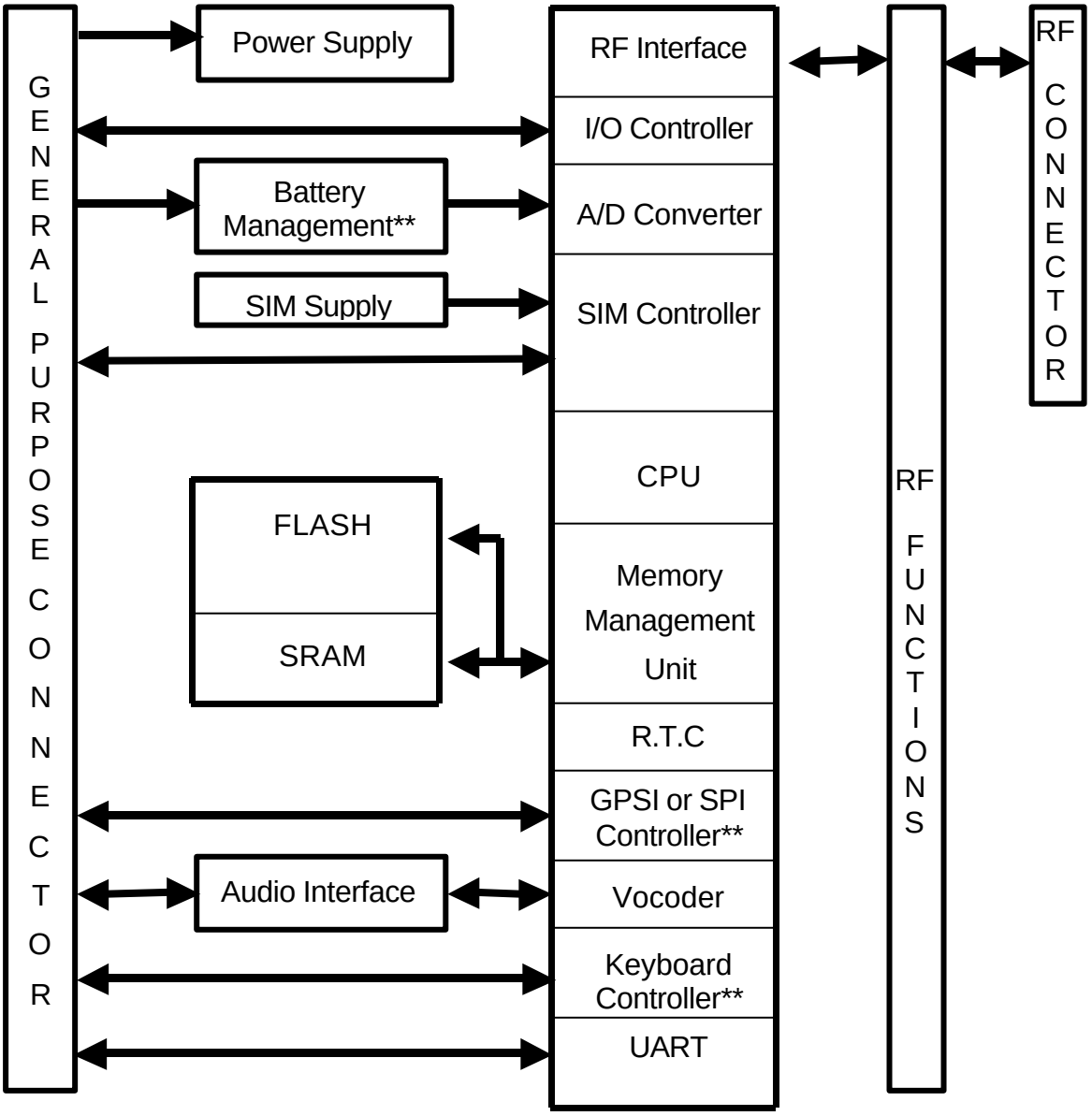
3. Interfaces

3.1. Functional Description



Nota : ** interfaces not available with AT commands

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3.2. RF interface

Two land patterns set on the PCB support the RF connection which can be used by the application through spring contacts or a soldered RF cable.

The WISMO2C does not support antenna switch for car kit but provides this function externally through its I/O ports.

3.3. General Purpose Connector (GPC)

A 60 pins connector is provided to interface the WISMO2C with a board containing either a LCD module, or a keyboard, or a SIM connector, or a battery connection... This connector is a 0.5mm pitch connector from KYOCERA / AVX with a stacking height of 3.0mm. the matting reference of the connector is the following :

24 5087 060 X00 861

Caution : The WISMO2C supports a **2.8V** digital interface.

(Nota : **X** = 2 or 9)

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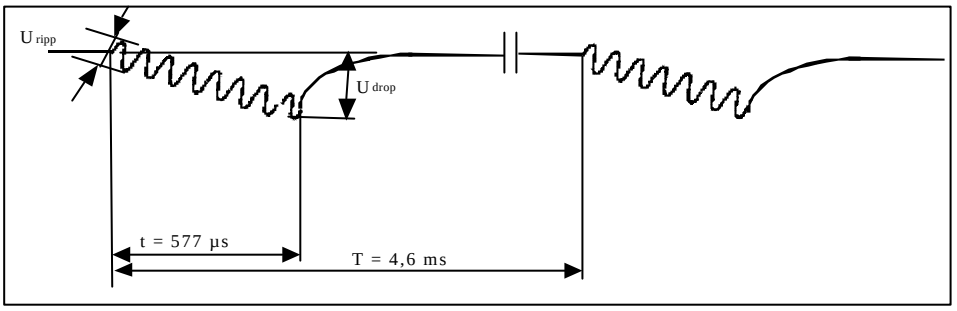
3.3.1. Power supply

Two different inputs are provided for the power supply. The first one, VBATT is used to supply the RF part and VDD, the second one is used to supply the baseband part. The module WISMO2C may be directly connected to a 3 NiMH cells battery. A step-down converter may be used to improve standby time.

VBATT : supplies directly the RF components with 3,6 V. It is essential to keep a minimum voltage ripple at this connection in order to avoid any phase error. The RF Power Amplifier current (2.0A peak in GSM mode) flows with a ratio of 1/8 of the time (around 577µs every 4.615ms). The rising time is around 10µs.



VDD : supplies the +2.8V ballast regulators of the WISMO2C. It is essential to keep the voltage over 3.1 volts. Another option would be to connect VBATT to VDD.

The WISMO2C shielding case is the grounding. The ground has to be connected on the mother board through a complete layer on the PCB.

Power Supply Voltage

	V_{MIN}	V_{NOM}	V_{MAX}	Ripple max
VBATT	3.3 V (*)	3.6 V	5.0 V	
VDD	3.1 V		5.0V	100 mV

(*) : This value has to be guaranted during the burst (with 2.0A Peak in GSM mode)

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Power consumption in EGSM mode

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @ 2W	1.7 A peak	2.0 A peak
VBATT	During RX bursts	75 mA peak	80 mA peak
VBATT	Average @ 2W	270 mA	320 mA
VBATT	Average @ 0.5W	180 mA	200 mA
VBATT	Average Idle mode	100 µA	300 µA
VDD	Average TCH/FS mode	85 mA	100 mA
VDD	Average Idle mode	3 mA*	6 mA*

* Informative value

Power consumption in DCS mode

	Conditions	I_{NOM}	I_{MAX}
VBATT	During TX bursts @ 1W	1.3 A peak	1.7 A peak
VBATT	During RX bursts	75 mA peak	80 mA peak
VBATT	Average @ 1W	240 mA	270 mA
VBATT	Average @ 0.25W	150 mA	180 mA
VBATT	Average Idle mode	100 µA	300 µA
VDD	Average TCH/FS mode	85 mA	100 mA
VDD	Average Idle mode	3 mA	6 mA

* Informative value

WISMO2C monitors the voltage of the battery to give a rough indication of its remaining capacity and to control its fast charger.

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Power Supply Pinout

Signal	Pin number
VBATT	55, 57, 58, 59 60
VDD	11
GND	Shielding

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3.3.2. Serial link

A flexible 6 wires serial interface is available complying with V24 protocol signaling but not with V28 (electrical interface) due to a 2.8 Volts interface.

The signals are Tx data (CT103/TX), Rx data (CT104/RX), Request To Send (CT105/RTS), Clear To Send (CT106/CTS), Data Terminal Ready (CT108-2/DTR) and Data Set Ready (CT107/DSR).

The set of RS232 signals can be required for GSM DATA services application and is generated by the general purpose I/O provided by the WISMO2C. The 2 additional signals are Data Carrier Detect (CT109/DCD) and Ring Indicator (CT125/RI).

Pin description

Signal	Pin number	I/O	I/O type	Description
CT103 / TX	39	I	CMOS	Transmit serial data
CT104 / RX	32	O	1X	Receive serial data
CT105 / RTS	30	I	CMOS	Ready To Send
CT106 / CTS	37	O	1X	Clear To Send
CT107 / DSR	36	O	1X	Data Set Ready
CT108-2 / DTR	34	I	CMOS	Data Terminal Ready
CT109 / DCD	51	O	CMOS / 2X	Data Carrier Detect
CT125 / RI	54	O	CMOS / 2X	Ring Indicator
CT102/GND	Shielding legs			Ground

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3.3.3 SIM interface

3.3.3.1 General Description

5 signals exist :

- SIMVCC : SIM power supply.
- SIMRST : reset.
- SIMCLK : clock.
- SIMDATA : I/O port.
- SIMPRES : SIM card detect.

The SIM interface controls a 3V SIMs (and a 5V SIMs through an external SIM driver). This interface is fully compliant with GSM 11.11 recommendations concerning SIM functions.

It is recommended to add Transient Voltage Suppressor diodes on the signal connected to the SIM socket in order to prevent any ElectroStatic Discharge. TVS diodes with low capacitance (less than 10pF) have to be connected on SIMCLK and SIMDATA to avoid any disturbance of the rising and falling edge. These types of diodes are mandatory for the Full Type Approval.

3.3.3.2 Typical SIM 3V

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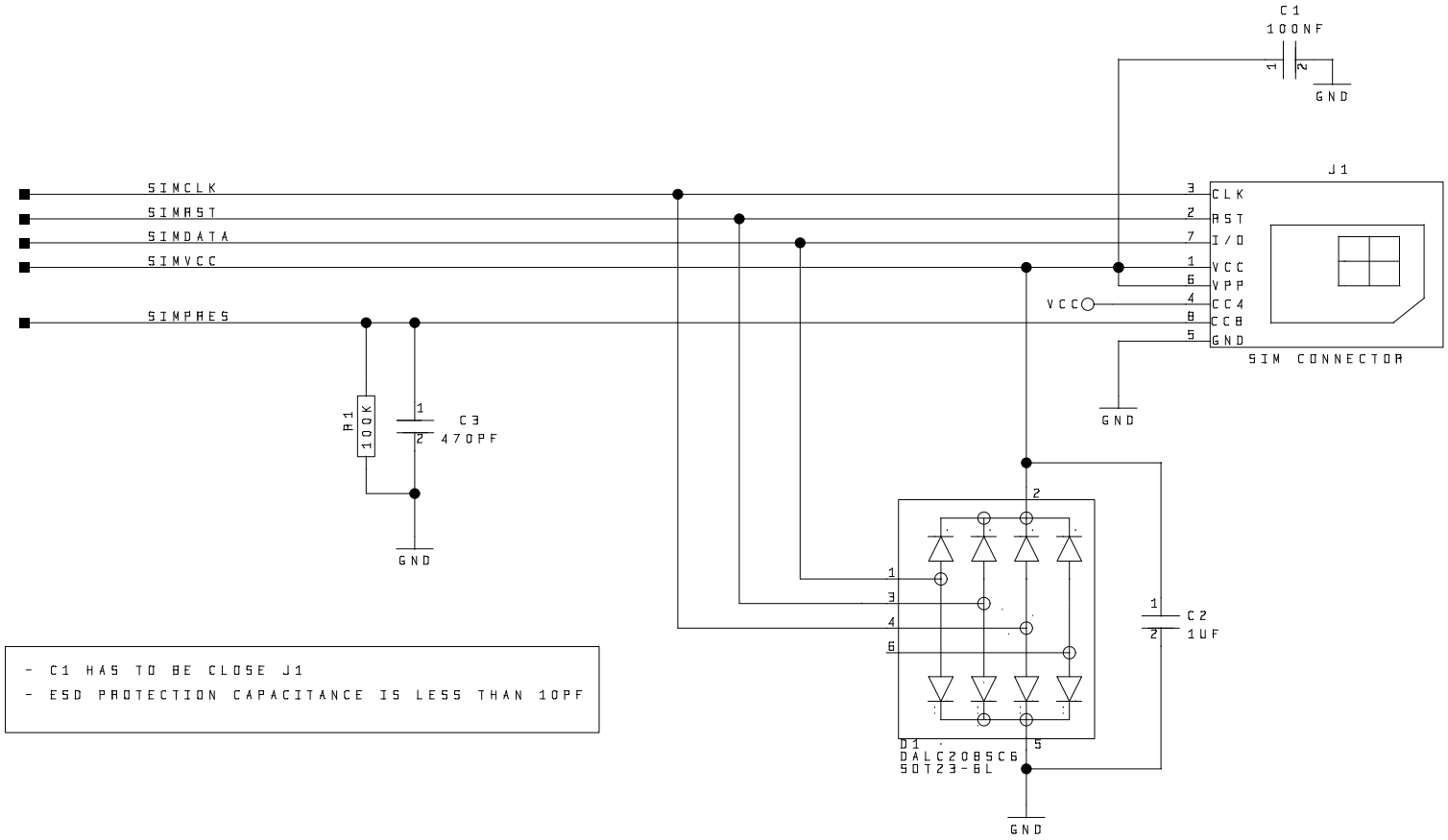

- C1 HAS TO BE CLOSE J1
- ESD PROTECTION CAPACITANCE IS LESS THAN 10PF

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The shock wave in the wireless world

PROJECT: APPLICATION NOTE	Sheet: 1/1
SCHEMATIC:SIM 3V ONLY (WISMO2C)	
WAVECOM 39 Rue du Gouverneur Eboue 92130 ISSY LES MOULINEAUX FRANCE	Date: 06/01/2000 Version: 1.00 Eng:JMB

3.3.3.3 Typical Application for SIM 3V-5V

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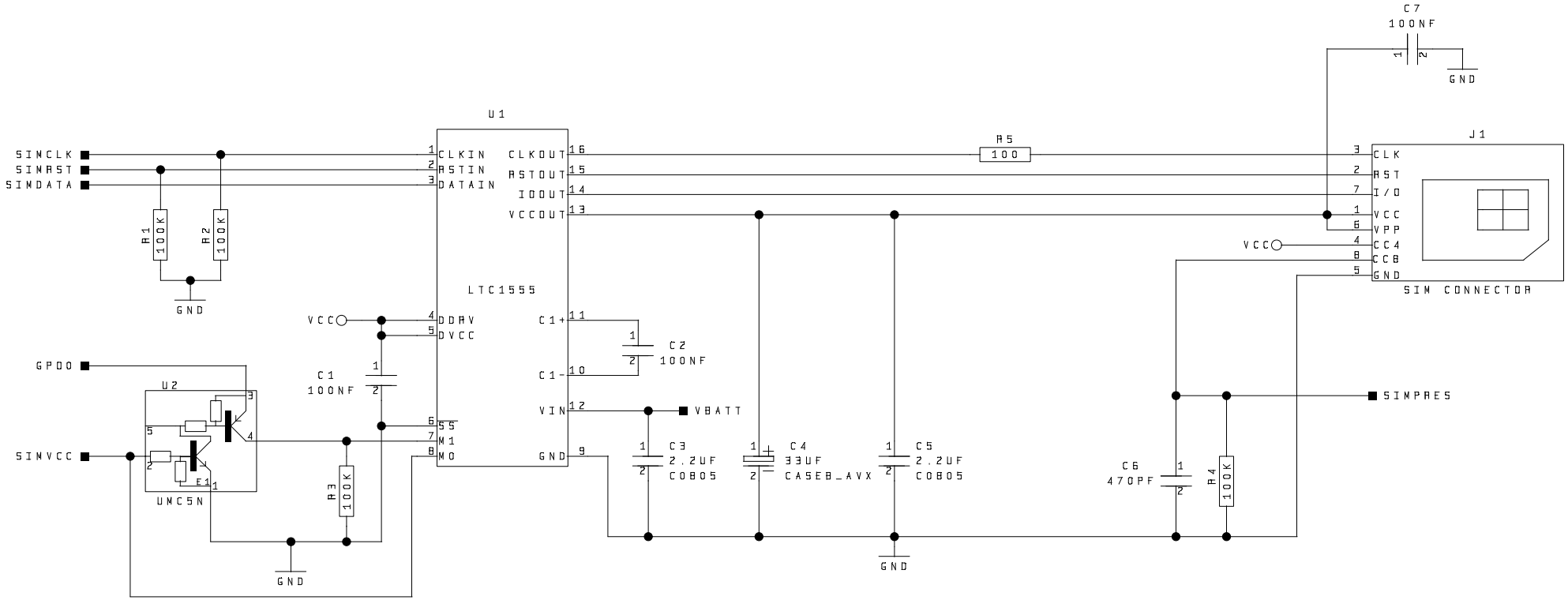

- C4 HAS TO BE CLOSE (13) & (9) OF U1
- C4 IS A LOW ESR TANTALUM CAPACITOR
- C7 HAS TO BE CLOSE J1

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The shock wave in the wireless world

PROJECT: APPLICATION NOTE	Sheet: 1/1
SCHEMATIC: SIM 3V-5V (WISMO2C)	
WAVECOM 39 Rue du Gouverneur Eboue 92130 ISSY LES MOULINEAUX FRANCE	Date: 06/01/2000 Version: 1.00 Eng: JMB

Pin description

Signal	Pin number	I/O	I/O type	Description
SIMCLK	3	O	2X	SIM Clock
SIMRST	5	O	2X	SIM Reset
SIMDATA	7	I/O	CMOS / 3X	SIM Data
SIMVCC	9	O		SIM Power Supply
SIMPRES	50	I	CMOS	SIM Card Detect

Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
SIMDATA V_{IH}	I_{IH} = ± 20µA	0.7xSIMVCC			V
SIMDATA V_{IL}	I_{IL} = 1mA			0.3xSIMVCC	V
SIMRST, SIMDATA SIMCLK V_{OH}	Source current = 20µA	SIMVCC – 0.1V			V
SIMRST, SIMDATA SIMCLK V_{OL}	Sink current = -200µA			0.1	V
SIMVCC Output Voltage	I_{SIMVCC} <= 6mA	2.70	2.80	2.85	V
SIMCLK Rise/Fall Time	Loaded with 30pF			50	ns
SIMRST, SIMDATA Rise/Fall Time	Loaded with 30pF			1	µs
SIMCLK Frequency	Loaded with 30pF			3.25	MHz

When not used **SIMPRES** has to be tied to VCC.

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When used, a low to high transition means that the SIM card is inserted and a high to low transition means that the SIM card is removed.

3.3.4. General Purpose Input/Output

The WISMO2C provides 5 General Purpose I/O, 3 General Purpose Outputs and 1 General Purpose Input. They are used to control any external device such as a LCD or a Keyboard backlight.

Pin description

Signal	Pin number	I/O	I/O type	Description
GPIO0	24	I/O	CMOS / 2X	General Purpose I/O
GPIO1	52	I/O	CMOS / 2X	General Purpose I/O
GPIO2	54	I/O	CMOS / 2X	General Purpose I/O
GPIO3	51	I/O	CMOS / 2X	General Purpose I/O
GPIO4	53	I/O	CMOS / 2X	General Purpose I/O
GPO0	26	O	3X	General Purpose O
GPO1	22	O	3X	General Purpose O
GPO2	20	O	1X	General Purpose O
GPI	18	I	CMOS	General Purpose I

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3.3.5. Analog to Digital Converter

Analog to Digital converter input is provided by the WISMO2C. This converter is a 10 bits one, ranging from 0 to 2.5V .

Pin description

Signal	Pin number	I/O	I/O type	Descsiption
AUXV0	33	I	Analog	A/D converter

Electrical Characteristics

Parameter	Min	Max	Unit
Resolution	10		bits
Sampling rate	90.3		Ksps
Input signal range	0	2.5V	V
ADC Reference Accuracy	0.5		%
Integral Accuracy	+/- 1		LSB
Differential Accuracy	+/- 1		LSB
Input Impedance (R)	10		MΩ
Input Impedance (C)		50	pF

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3.3.6. Audio

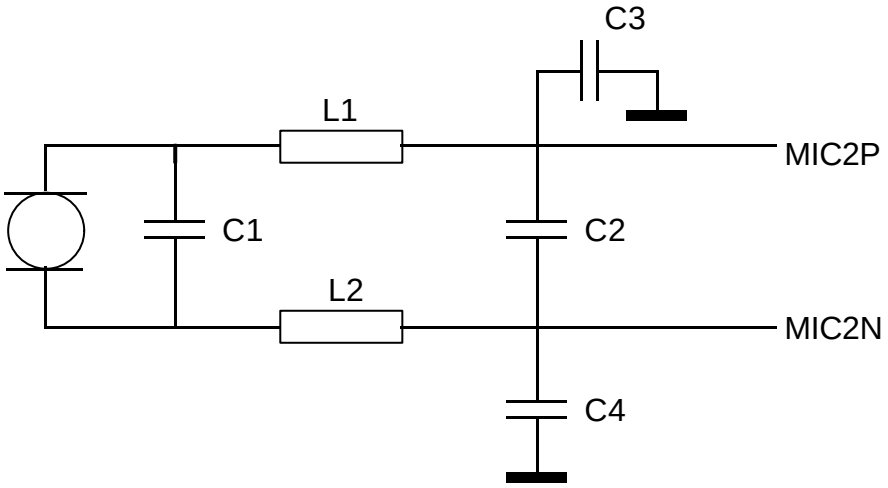
Two different microphone inputs and two different speaker outputs are supported. A buzzer output is also available and can be used as a Ring Indicator.

The WISMO2C also includes an echo cancellation feature which allows handsfree function.

3.3.6.1. Microphone 2 Inputs

The MIC2 inputs are differential ones. They already include the convenient biasing for an electret microphone (0,5 mA and 2 Volts). This electret microphone can be directly connected on these inputs. The impedance of the microphone 2 has to be around 2kΩ. These inputs are the standard ones for an handset design while MIC1 inputs can be connected to an external headset or a handsfree kit.

The gain of MIC2 inputs is internally adjusted. The gain can be tuned from 30dB to 51dB.



C1 = C2 = C3 = C4 = 22pF to 100pF
L1 = L2 = 100nH

C1 has to be the nearest possible to the microphone. Microphone manufacturers provide this capacitor directly soldered on the microphone.

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C2 has to be very close to the WISMO2C connector.

L1, L2, C3 and C4 has to be put near the WISMO2C connector and can be removed according to their environment (ground plane, shielding, etc…). The best way is to plan all the components and to remove those which are not necessary to filter out the TDMA noise on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC2P	46	I	Analog	Microphone 2 positive input
MIC2N	48	I	Analog	Microphone 2 negative input

Microphone gain vs Max input voltage

Gain (dB)	Vin (mVrms)
0	965
30	30.5
33	21.6
36	15.3
39	10.9
42	7.8
45	5.5
48	3.9
51	2.7

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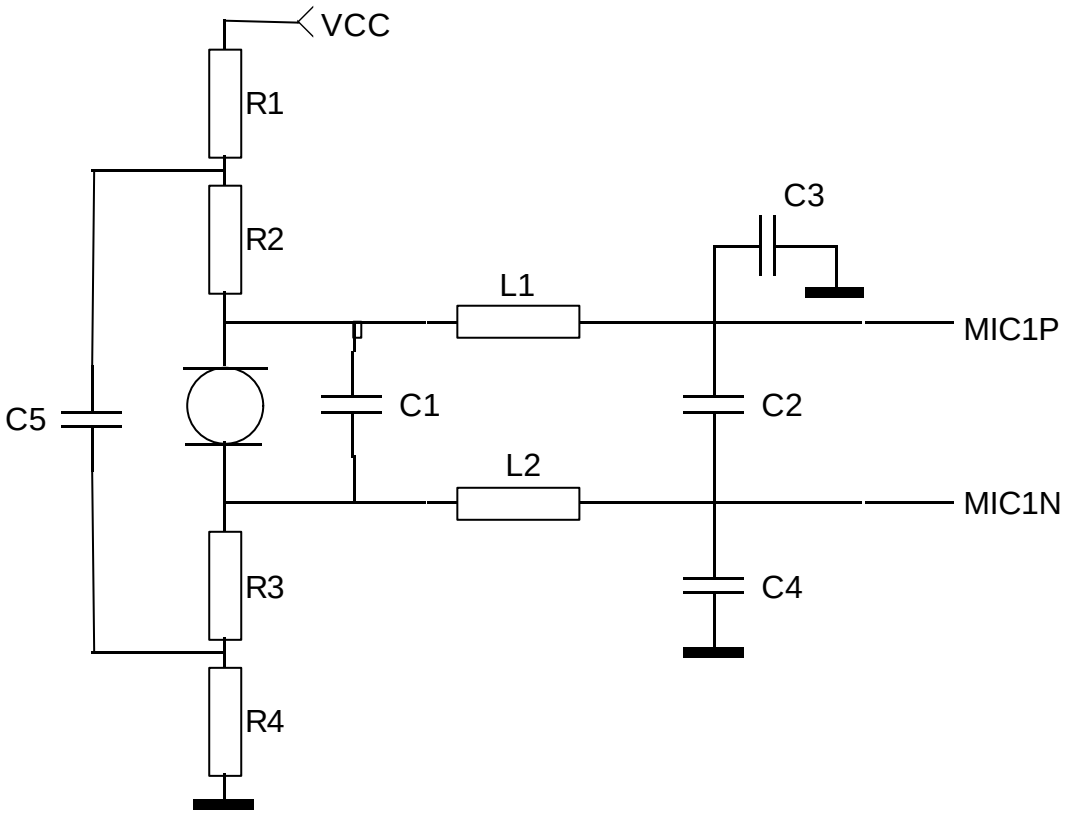
3.3.6.2. Microphone 1 Inputs

The MIC1 inputs are differential and do not include internal bias. To use these inputs with an electret microphone, bias has to be generated outside the WISMO2C module according to the characteristic of this electret microphone. These inputs are the standard ones used for an external headset or a handsfree kit. The connection can be either differential or single-ended but using a differential connection in order to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

The gain of MIC1 inputs is internally adjusted. The gain can be tuned from 30dB to 51dB.

Differential connection



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R1 = R4 = from 100 to 330Ω
R2 = R3 = usually between 1KΩ and 3.3KΩ as per the microphone characteristics
C1 = C2 = C3 = C4 = 22pF to 100pF
C5 = 47µF
L1 = L2 = 100nH

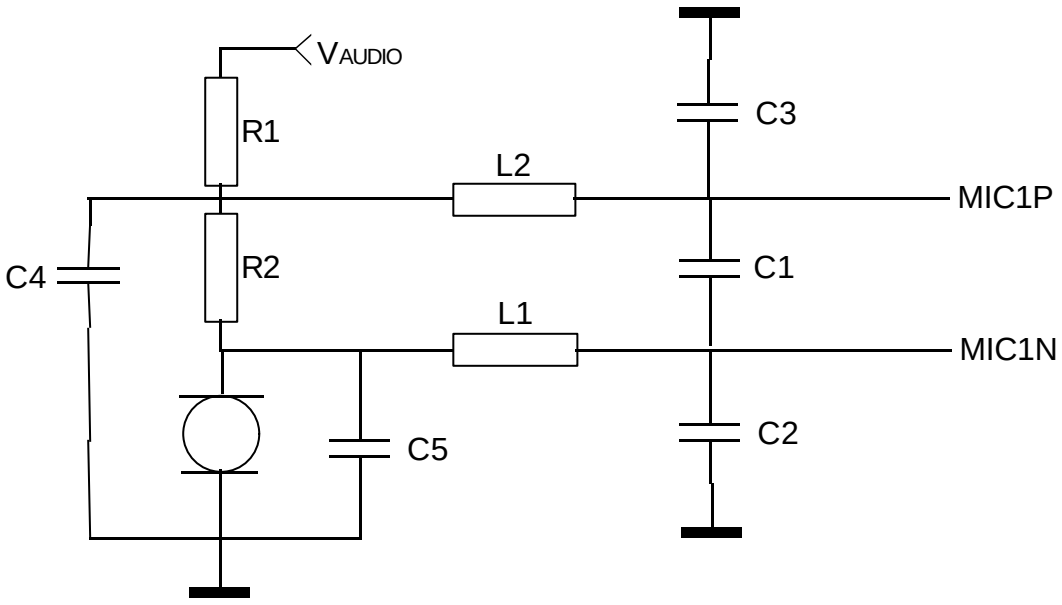
R1 and R4 are used as a voltage supply filter with C5.

C1 has to be the nearest possible to the microphone. Microphone manufacturers provide this capacitor directly soldered on the microphone.

C2 has to be very close to the WISMO2C connector.

L1, L2, C3 and C4 has to be put near the WISMO2C connector and can be removed according to their environment (ground plane, shielding ...etc). The best way is to plan all the components and to remove those which are not necessary to filter out the TDMA noise on the audio path.

Single-ended connection



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Note : V_{AUDIO} must be very “clean” in single-ended connection (for example, VCC plus filter cell like RC or LC).

R1 = from 100 to 330Ω
R2 = usually between 1KΩ and 3.3KΩ as per the V_{AUDIO} voltage level and the microphone characteristics
C1 = C2 = C3 = C5 = 22pF to 100pF
C4 = 47µF
L1 = L2 = 100nH

R1 is used as a voltage supply filter with C4.

C5 has to be the nearest possible to the microphone. Microphone manufacturers provide this capacitor directly soldered on the microphone.

C1, C2, C3 have to be very close to the WISMO2C connector.

L1, and L2 has to be put near the WISMO2C connector and can be removed according to their environment (ground plane, shielding ...etc). The best way is to plan all the components and to remove those which are not necessary to filter out the TDMA noise on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC1P	42	I	Analog	Microphone 1 positive input
MIC1N	44	I	Analog	Microphone 1 negative input

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Microphone gain vs Max input voltage

Gain (dB)	Vin (mVrms)
0	965
30	30.5
33	21.6
36	15.3
39	10.9
42	7.8
45	5.5
48	3.9
51	2.7

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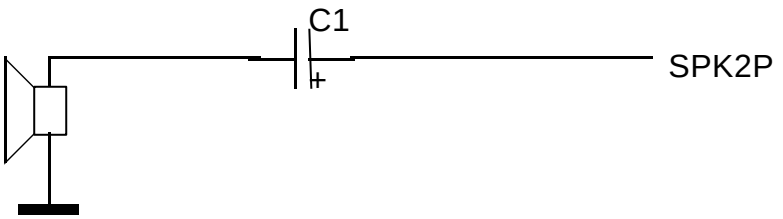
3.3.6.3. Speaker 2 Outputs

Speaker outputs SPK2 are push-pull amplifiers and can be loaded down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be directly connected to a speaker.

The connection can be differential or single-ended but using a differential connection to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

Differential Connection

Single-ended Connection



C1 = from 100nF to 47µF as per the speaker characteristics and the output power.

Using a single-ended connection also includes losing half of the output power compared to a differential connection.

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Pin description

Signal	Pin #	I/O	I/O type	Description
SPK2P	45	O	Analog	Speaker 2 positive output
SPK2N	47	O	Analog	Speaker 2 negative output

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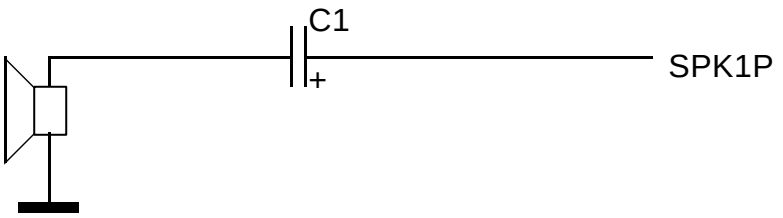
3.3.6.4 Speaker 1 Outputs

Speaker outputs SPK1 are push-pull amplifiers and can be loaded down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be directly connected to a speaker.

The connection can be differential or single-ended but using a differential connection to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as a shielding in order to avoid any disturbance on the audio path.

Differential Connection

Single-ended Connection



C1 = from 100nF to 47µF as per the speaker characteristics.

Using a single-ended connection also includes losing half of the output power compared to a differential connection.

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Pin description

Signal	Pin #	I/O	I/O type	Description
SPK2P	41	O	Analog	Speaker 1 positive output
SPK2N	43	O	Analog	Speaker 1 negative output

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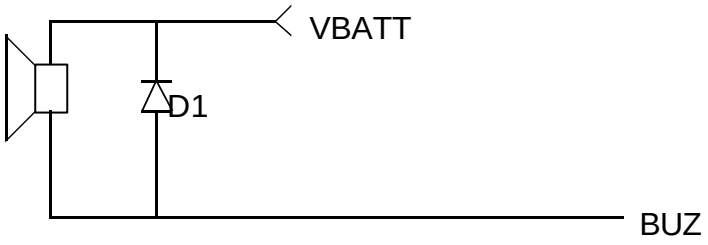
3.3.6.5. Buzzer Output

The buzzer output is a digital one. A buzzer can be directly connected between this output and VBATT. The maximum current is 80 mA (PEAK). A diode against transient peak current must be connected and the buzzer as described below.

Buzzer Connection



Pin description

Signal	Pin #	I/O	I/O type	Description
BUZ	49	O	Analog	Buzzer output

Operating conditions

Parameter	Condition	Min	Max	Unit
V_{OL}	Imoy = 40mA		0.6	V
I_{PEAK}	VBATT = VBATTmax		80	mA
$I_{AVERAGE}$	VBATT = VBATTmax		40	mA

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3.3.7. Miscellaneous

3.3.7.1. ON / ~OFF

This input is used to switch ON or OFF the WISMO2C module. A high level signal has to be provided on the pin ON/~OFF to swith ON the module. The level of the voltage of this signal has to be maintained between 2.4V and VDD during a minimum of 500ms. This signal can be left at high level until switch off.

To be able to switch OFF the module the pin ON/OFF has to be released. Through the firmware, the module can down to switch off.

Pin description

Signal	Pin number	I/O	I/O type	Description
ON/~OFF	6	I	CMOS	Module Power ON

Electrical Characteristics

Parameter	Min	Max	Unit
Input Impedance (R)	10		kΩ
Input Impedance (C)		50	pF

Operating conditions

Parameter	I/O type	Min	Max	Unit
V_{IL}		0 V	0.6 V	V
V_{IH}		2.4 V	VDD+0.5V	V

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3.3.7.2. BOOT

This input is used to download a software in the Flash ROM of the WISMO2C module. The internal boot procedure is started when this pin is low during the reset of the module. In normal mode this pin has to be left open. In Internal boot mode low level has to be set through a 1K resistor. If used, this input has to be driven by an open collector or an open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
BOOT	12	I	CMOS	Flash Loading

3.3.7.3. Reset signal (~RST)

This signal is used to force a reset procedure by providing low level during at least 100µs. This signal has to be considered as an emergency reset only. A reset procedure is already driven by an internal hardware during the power-up sequence.

This signal can also be used to provide a reset to an external device. If no external reset is necessary this input can be left open. If used (emergency reset), it has to be driven by an open collector or an open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
~RST	14	I/O		Module Reset

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Electrical Characteristics

Parameter	Min	Max	Unit
Input Impedance (R)	4.7		kΩ
Input Impedance (C)		10	nF

Operating conditions

Parameter	Min	Max	Condition
$*V_{T-}$	1.1V	1.2 V	
$*V_{T+}$	1.7V	1.9 V	
V_{OL}		0.4 V	I_{OL} = -50 µA
V_{OH}	2.0 V		I_{OH} = 50 µA

***** V_{T-}, V_{T+} : Hysterisis Level

3.3.7.4. External Interrupt (~INTR)

The WISMO2C provides an external interrupt input. This input is very sensitive and an interrupt is activated on high to low edge. If this signal is not used it can be left open. If used this input has to be driven by an open collector or an open drain.

Pin description

Signal	Pin number	I/O	I/O type	Description
~INTR	16	I	CMOS	External Interrupt

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Electrical characteristics

Parameter	Min	Max	Unit
V_{IL}	-0.5V	0.7V	Volt
V_{IH}	2.2V	3.0V	Volt

3.3.7.5. VCC output

This output can be used to power some external functions. **VCC** has to be used as a digital power supply. This power supply is available when the module is on.

Pin description

Signal	Pin number	I/O	I/O type	Description
VCC	40	O	Supply	Digital supply

Operating conditions

Parameter	Condition	Min	Max	Unit
Ouput voltage	I = 10mA	2.74	2.86	V
Output Current			10	mA

3.3.7.6 VCC_RTC (Real Time Clock)

This pin is used as a back-up power supply for the internal Real Time Clock. The RTC is supported by the module when powered on but a back-up power supply is needed to save date and hour when the module is switched off.

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If the RTC is not used this pin can be left open.

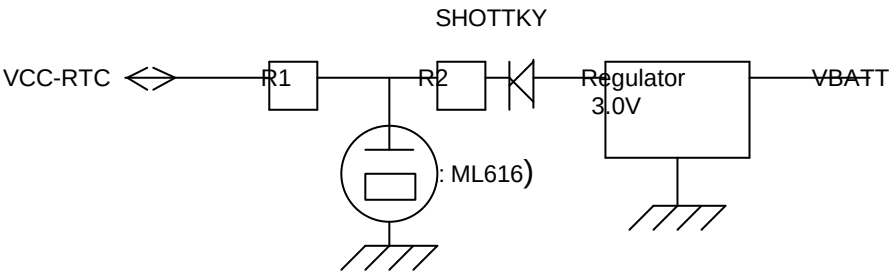
Pin description

Signal	Pin number	I/O	I/O type	Description
VCC_RTC	56	I/O	Supply	RTC Back-up supply

Operating conditions

Parameter	Condition	Min	Max	Unit
Input voltage		2	2.8	V
Input Current	VCC=0V; t°C = 25°C VCC_RTC=2.5V ;		3	µA
Input Current	VCC=0V; t°:-20°C / 55°C VCC_RTC=2.5V ;		10	µA
Output voltage		2.4	2.9	V
Output current			2	MA

Application example



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4. Technical Specifications

4.1. Electrical specifications

4.1.1. RF connection

The impedance is 50 Ohms nominal and the DC impedance is 0 Ohm.

4.1.2. Digital I/O

All digital I/O comply with 3Volts CMOS.

Operating conditions

Parameter	I/O type	Min	Max	Condition
V_{IL}	CMOS	-0.5 V	0.8 V	
V_{IH}	CMOS	2.1 V	3.0 V	
V_{OL}	1X		0.2 V	I_{OL} = -1 mA
	2X		0.2 V	I_{OL} = -2 mA
	3X		0.2 V	I_{OL} = -3 mA
V_{OH}	1X	2.6 V		I_{OH} = 1 mA
	2X	2.6 V		I_{OH} = 2 mA
	3X	2.6 V		I_{OH} = 3 mA

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4.2. RF performances

RF performances are compliant with the ETSI recommendation 05.05 and 11.10.

The main parameters are :

- Receiver:
    - EGSM Sensitivity : < -104 dBm
    - DCS Sensitivity : < -100 dBm
    - Selectivity @ 200 kHz : > +9 dBc
    - Selectivity @ 400 kHz : > +41 dBc
    - Dynamic range : 62 dB
    - Intermodulation : > -43 dBm
    - Co-channel rejection : >= 9 dBc
- Transmitter :
    - Maximum output power (EGSM) : 33 dBm +/- 2 dB
    - Maximum output power (DCS) : 30 dBm +/- 2 dB
    - Minimum output power (EGSM) : 5 dBm +/- 5 dB
    - Minimum output power (DCS) : 0 dBm +/- 5 dB
    - H2 level : < -30 dBm
    - H3 level : < -30 dBm
    - Noise in 925 - 935 MHz : < -67 dBm
    - Noise in 935 - 960 MHz : < -79 dBm
    - Noise in 1805 - 1880 MHz : < -71 dBm
    - Phase error at peak power : < 5 ° RMS
    - Frequency error : +/- 0.1 ppm max

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4.3. Climatic and mechanical environments

WM2C-G900/G1800		ENVIRONNEMENTAL CLASSES		
TYPE OF TEST	STANDARDS	STORAGE Class 1.2	TRANSPORTATION Class 2.3	OPERATING (PORT USE) Class 7.3
Cold	IEC 68-2.1 Ab test	-25° C 72 h	-40° C 72 h	-20° C (GSM) 16 h -10° C (DCS) 16 h
Dry heat	IEC 68-2.2 Bb test	+70° C 72 h	+70° C 72 h	+55° C 16 h
Change of temperature	IEC 68-2.14 Na/Nb test		-40° / +30° C 5 cycles t1 = 3 h	-20° / +30° C (GSM) 3 cycles -10° / +30° C (DCS) 3 cycles t1 = 3 h
Damp heat cyclic	IEC 68-2.30 Db test	+30° C 2 cycles 90% - 100% RH variant 1	+40° C 2 cycles 90% - 100% RH variant 1	+40° C 2 cycles 90% - 100% RH variant 1
Damp heat	IEC 68-2.56 Cb test	+30° C 4 days	+40° C 4 days	+40° C 4 days
Sinusoidal vibration	IEC 68-2.6 Fc test	5 - 62 Hz : 5 mm / s 62 - 200Hz : 2 m / s2 3 x 5 sweep cycles		
Random vibration wide band	IEC 68-3.36 Fdb test		5 - 20 Hz : 0.96 m2 / s3 20 - 500Hz : - 3 dB / oct 3 x 10 min	10 -12 Hz : 0.96 m2 / s3 12 - 150Hz : - 3 dB / oct 3 x 30 min

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4.4. Interfaces

Pin #	Name	I/O	I/O type	Description	Comment
1	Reserved	I			
2	Reserved	I			
3	SIMCLK	O	2 X	Clock for SIM interface	
4	Reserved	I			
5	SIMRST	O	2 X	Reset for SIM interface	
6	ON/~OFF	I	CMOS	Power ON/OFF control	
7	SIMDATA	I/O	CMOS / 3X	I/O for SIM interface	
8	Reserved	I/O			
9	SIMVCC	O	Supply	SIM card supply	6mA max
10	Reserved	O			
11	VDD	I	Supply	Low power supply	3.1V minimum or connected to VBATT
12	BOOT	I	CMOS	BOOT	Pull down through 1K for Flash downloading
13	Reserved	I/O			
14	~RST	I/O	SCHMITT	Module Reset	Active low
15	Reserved	I/O			
16	~INTR	I	CMOS	External interrupt	Active low. 100K Pull-up inside
17	Reserved	I/O			
18	GPI	I	CMOS	General Purpose Input	100K Pull-down inside
19	Reserved	I/O			
20	GPO2	O	1X	General Purpose Output	
21	Reserved	I/O			
22	GPO1	I/O	3X	General Purpose Output	
23	Reserved	I/O			
24	GPIO0	I/O	CMOS/2X	General Purpose I/O	
25	Reserved	I/O			
26	GPO0 or SPI_AUX	O	3X	General Purpose Output or SPI Aux enable SIM 3V / 5V	
27	Reserved	I/O			
28	Reserved	O			
29	Reserved	I/O			
30	CT105/RTS	I	CMOS	RS232 interface Request To Send	Pull up to VCC with 100KΩ when not used
31	Reserved	I/O			
32	CT104/RX	O	1X	RS232 interface – Receive	
33	AUXV0	I	Analog	Auxiliar ADC input 0	
34	CT108-2/DTR	I	CMOS	RS232 interface Data Terminal Ready	Pull up to VCC with 100KΩ when not used

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35	*Reserved*				
36	CT107/DSR	O	1X	RS232 interface Data Set Ready	
37	CT106/CTS	O	1X	RS232 interface Clear To Send	
38	BAT_TEMP	I	Analog	ADC input for battery temperature measurement	
39	CT103/TX	I	CMOS	RS232 interface – Transmit	Pull up to VCC with 100 KΩ when not used
40	VCC	O	Supply	2.8V digital supply output	10mA max.
41	SPK1P	O	Analog	Speaker 1 positive output	
42	MIC1P	I	Analog	Microphone 1 positive input	
43	SPK1N	O	Analog	Speaker 1 negative output	
44	MIC1N	I	Analog	Microphone 1negative input	
45	SPK2P	O	Analog	Speaker 2 positive output	
46	MIC2P	I	Analog	Microphone 2 positive input	
47	SPK2N	O	Analog	Speaker 2 negative output	
48	MIC2N	I	Analog	Microphone 2 negative input	
49	BUZ	O	Analog	Buzzer output	80mA max
50	SIMPRES	I	CMOS	SIM Card Detect	
51	GPIO3 or CT109 / DCD	I/O O	CMOS/2X	General Purpose I/O RS232 – Data Carrier Detect	
52	GPIO1 FLASH LED	I/O	CMOS/2X	General Purpose I/O Module State	Handset application AT command appl.
53	GPIO4	I/O	CMOS/2X	General Purpose I/O	
54	GPIO2 or CT125 / RI	I/O O	CMOS/2X	General Purpose I/O RS232 - Ring Indicator	
55	+VBATT		Supply	Battery Input	High current
56	VCC_RTC	I/O	Supply	RTC back-up supply	
57	+VBATT		Supply	Battery Input	High current
58	+VBATT		Supply	Battery Input	High current
59	+VBATT		Supply	Battery Input	High current
60	+VBATT		Supply	Battery Input	High current

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4.5. Mechanical specifications

4.5.1. Physical characteristics

The WISMO2C module has a complete self-contained shield.

Dimensions : 58.3 x 32.2 x 6.0 mm

Weight : 20 g

4.5.2. Interface Connectors

The communication interface connector is a 60 pins connector with 0.5mm pitch from KYOCERA / AVX group with the following reference :

14 5087 060 930 861.

The matting connector has the following reference :

24 5087 060 X00 861*.

The stacking height is 3.0 mm.

The RF connection is allowed through two land patterns defined on the PCB in order to be used by the application with spring contacts or with a RF cable directly soldered on.

The grounding connection is allowed through the shielding (four legs).

*Nota : X = 2 or 9

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4.5.3. Mechanical drawings

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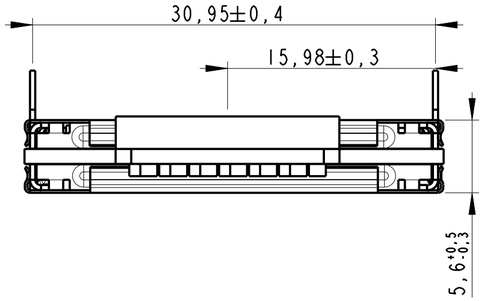

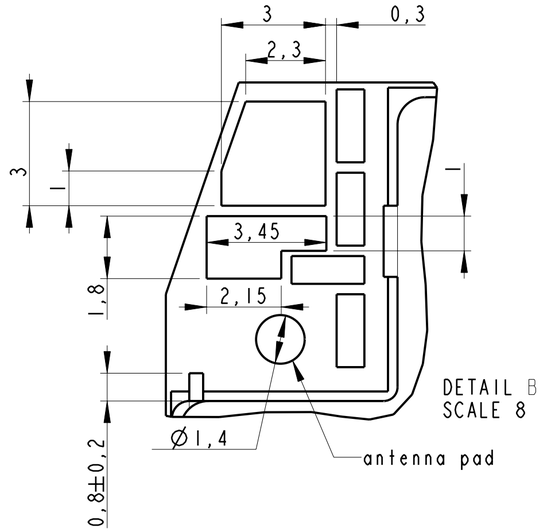

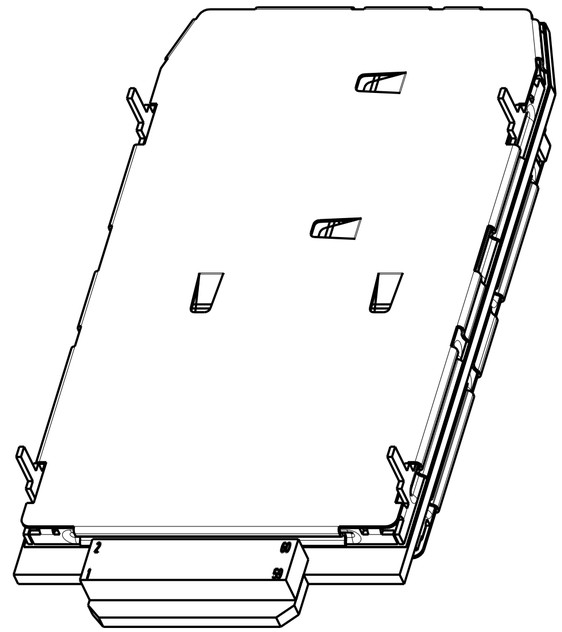

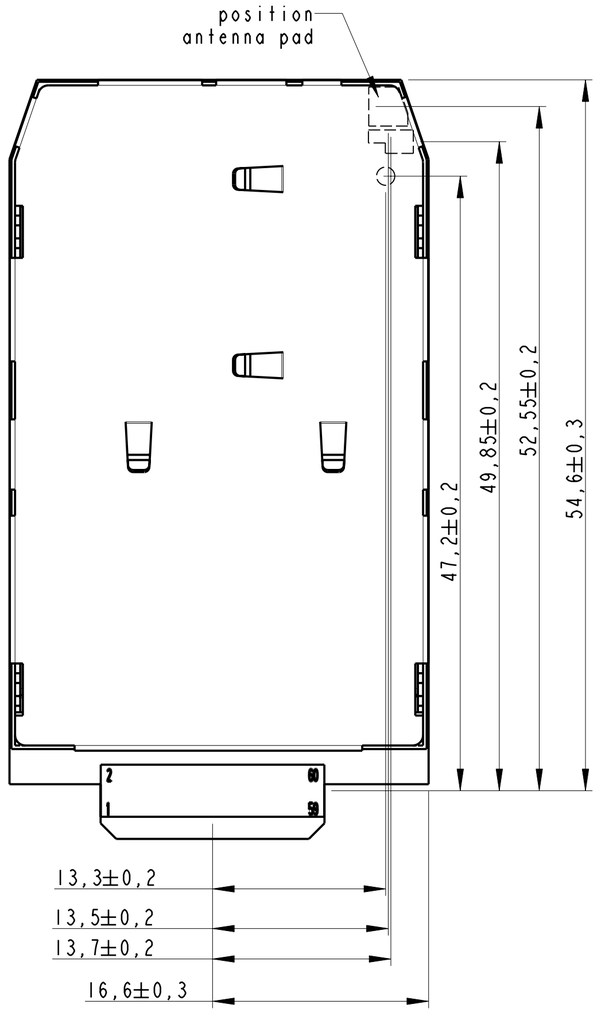

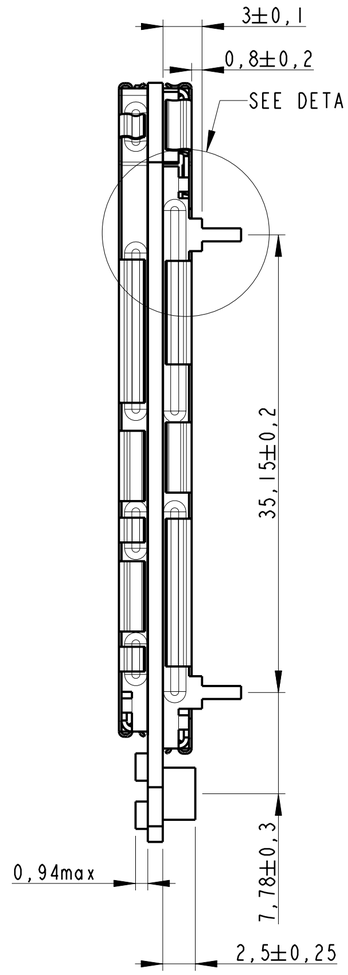

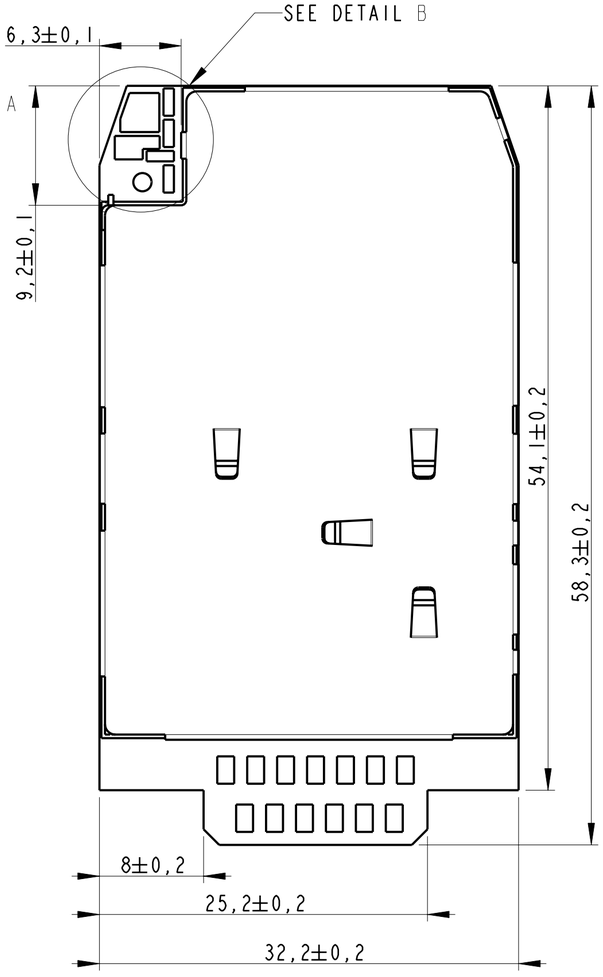

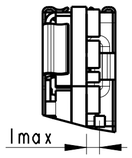

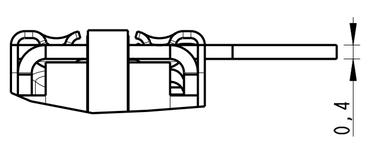

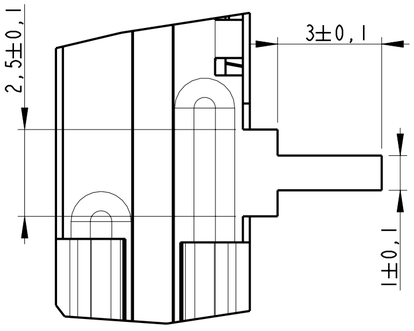

Creation	09 - 15 - 99	T. OGER	Preliminary
MODIFICATION	DATE	AUTHOR	STATUS

WM2C_AUTOMOTIVE		SCALE:3,000	FORMAT: A2	
	WM-2-9826-B-002-A			00
WAVECOM	AUTHOR T.OGER	FOLIO: 1/1		IND.

5. Appendix

5.1. Wavecom acceptance test

Désignation	Applied standard	Acceptance criteria
Performance Test	ETSI recommendation for GSM/DCS communication.	Full conformity to the recommendation regarding the main RF parameters.
Cooking Test	-	The test continues even after the Cooking Test milestone has been reached
Stress Test[1]	Therma shocks IEC 68-2-14.	Full conformity to the recommendation regarding the main parameters.
Vibration Test[1]	Sinusoidal vibration IEC 68-2-6.	No performance degradation or mechanical degradation is allowed after test.
Vibration Test[1]	Random vibration IEC 68-2-36.	No performance degradation or mechanical degradation is allowed after test.
Shock Test[1]	IEC 68-2-27.	No performance degradation or mechanical degradation is allowed after test.
Bump Test[1]	IEC 68-2-29.	No performance degradation or mechanical degradation is allowed after test.
Humidity Test[1]	Corrosion test IEC 68-2-3.	No visible degradation of the product, both visual and functionnal. The unit is tested at room temperature and must be fully operative for the main RF parameters.

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Warehouse Tet	Low temperance IEC 68-2-1.	Under normal condition (room temperature) after the test, the unit must behave in full conformity with the main RF parameters specification.
Warehouse Test	High temperature IEC 68-2-2.	Under normal condition (room temperature) after the test, the unit must behave in full conformity with the main RF parameters specification.
Dust Test1[2]	MIL-STD-810D, method 510-3.	No visible dust in the visible areas. No more than 50 dust particules in the cabinet of the product. The unit, tested at room temperature must be fully operative.
Light Test1[2]	UV radiation and temperature EDF HN60E03.	Visual inspection on the discoloration and other degradation effects such as cracks in the material of the unit after the test.
Fall Test1[2][3]	IEC 68-2-32.	Only minor casing degradation is allowed, with a maximum dimension change of 1mm. The unit must remain fully operative and full specification for the main RF parameters.
Electro Static Discharge Test[2]	IEC 1000-4-2.	No performance degradation allowed after the test.
Salt Mist Test[1][2]	IEC 68-2-11	After the test, visual inspection on the unit.
Atmosphere Test[1][2]	Flowing mixed gas corrosion. IEC 68-2-60	After the test, visual inspection on the unit and inside.
Marking Test[1][2]	EN 60 950	After the test, visual inspection on the unit. No degradation is allowed on the marking.

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5.2. Description of the main operating procedures

	Power ON	HW Reset	SW Reset	GSM stack stop	Regular power OFF
Power Supply	ON	ON	ON	ON	ON
Power ON/OFF (pin #6)	OFF⇨ON (high) Thold > 2s	ON	ON	ON	ON untill “OK” then OFF
State of the module	OFF⇨ON	ON	ON	ON	ON⇨OFF
Ext Reset (pin #14)	Inactive (open)	Active (low) Thold > 1ms	Inactive (open)	Inactive (open)	Inactive (open)
SW	/	/	AT+CFUN=1,1	AAT+CPOF	AT+CPOF
Comments	Internal reset (coming from a reset generator at Power-up) performed for 140ms. Module ready when AT↵ answers “OK”.	The module remains in reset mode as long as the RST signal is held low. This signal should be used only for “emergency” resets.	Initialization timing is SIM dependant & network dependent	Restart with AT+CFUN=1,1	TpwrOff is network dependent because of the IMSI detach procedure. Power supply could be switched OFF after the “OK” response.

Additional comments on RESET :
The RESET process is activated either by the external RST signal (pin #14) OR by an internal signal (coming from a RESET generator). This automatic reset is activated at Power-UP.
A software reset will be preferred to a HW reset (HW reset should be avoided if possible).

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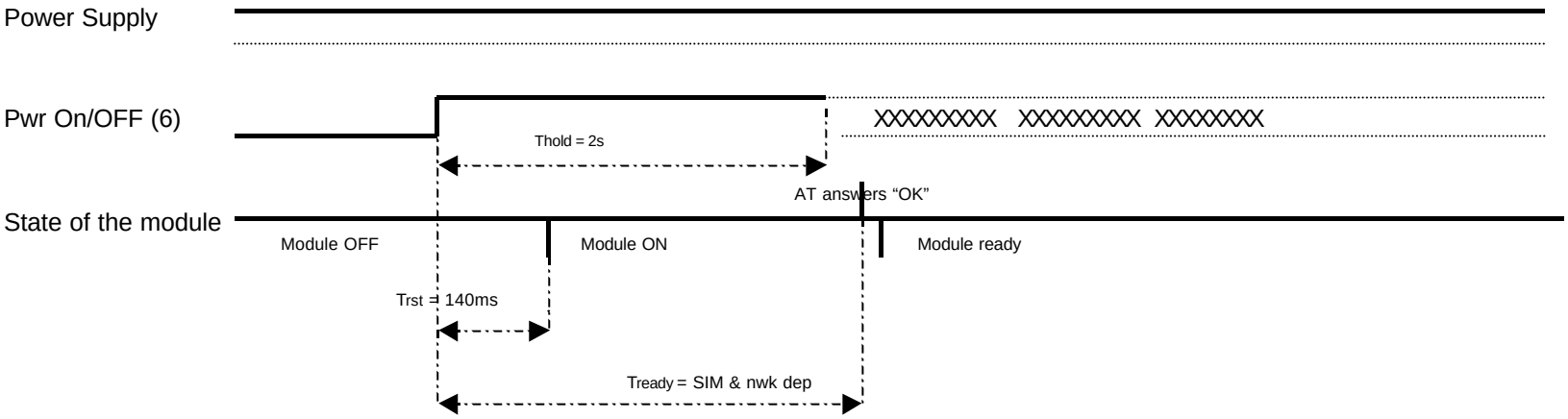
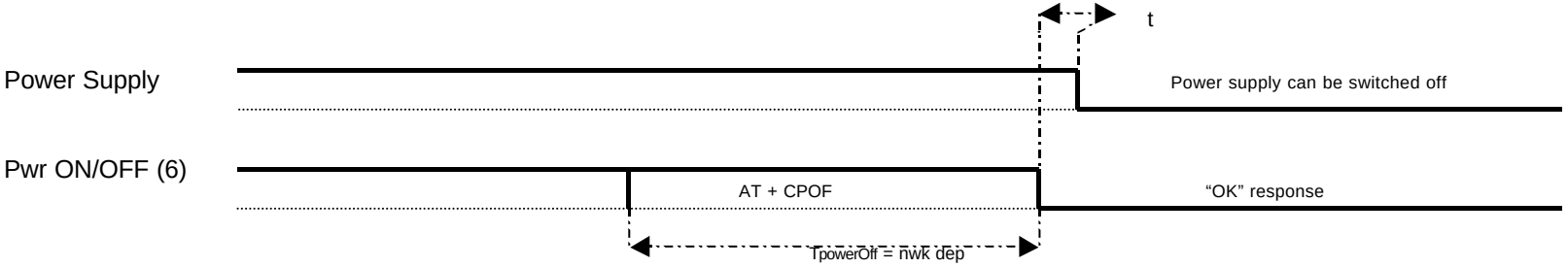
5.2.1. Power ON process (Pin code disabled)



5.2.2. Regular Power OFF process hardware driven



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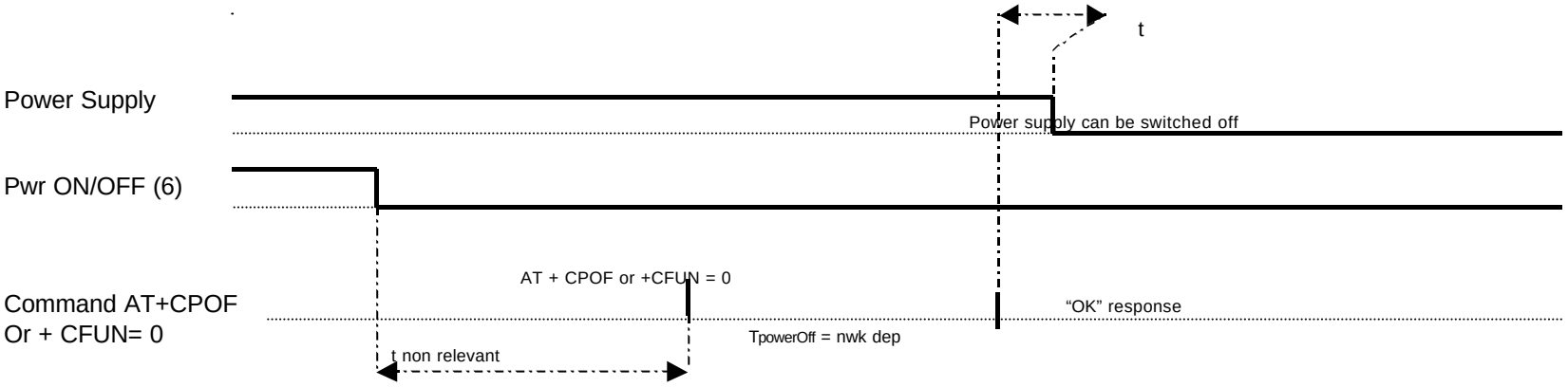
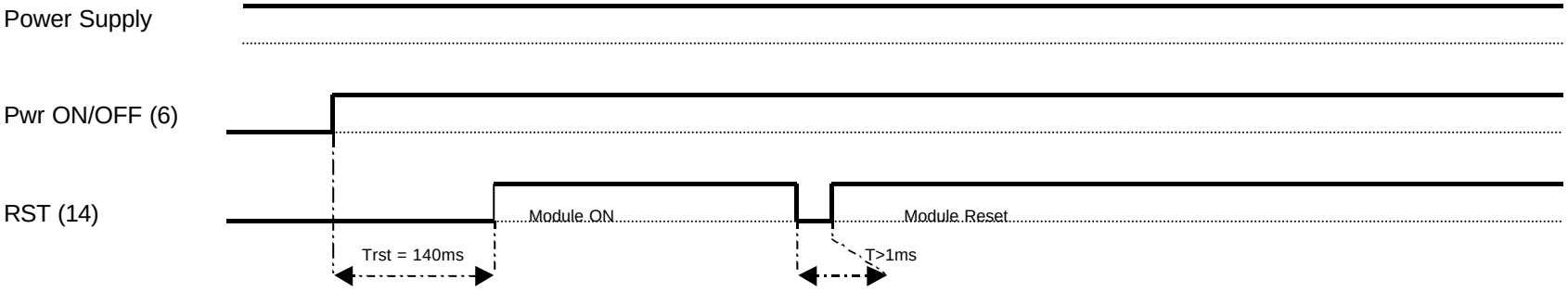
5.2.3. Regular Power OFF process software driven



5.2.4. HW Reset process



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